CLAIMS

1. A system for optical tomography, comprising:

an apparent light source adapted to project excitation light toward a specimen having fluorescent proteins therein, wherein the excitation light enters the specimen becoming intrinsic light within the specimen, wherein the intrinsic light is adapted to excite fluorescent light from the fluorescent proteins, and wherein the intrinsic light and the fluorescent light are diffuse.

2. The system of Claim 1, wherein at least one of the excitation light and the fluorescent light has a wavelength in the visible wavelength range.

3. The system of Claim 1, wherein the fluorescent light has a wavelength in the visible wavelength range.

4. The system of Claim 1, wherein the fluorescent light has a wavelength in the red portion of the visible wavelength range.

5. The system of Claim 1, wherein the fluorescent light has a wavelength in the near infrared (NIR) region.

6. The system of Claim 1, further including:

a light detector adapted to receive the intrinsic light exiting the specimen and adapted to receive the fluorescent light exiting the specimen, further adapted to convert the received intrinsic light into first image information, and further adapted to convert the received fluorescent light into second image information; and

an image processor coupled to the light detector and adapted to generate a light propagation model, wherein the model is adapted to predict light propagation in a diffuse medium, wherein the image processor is further adapted to combine the first image information, the second image information, and the light propagation model, and further adapted to provide an image of the fluorescent proteins.

7. The system of Claim 6, wherein the image processor includes a diffusion equation processor that uses a diffusion equation having a modified diffusion coefficient associated with at least one of the intrinsic light and the fluorescent light.

8. The system of Claim 6, wherein the light detector is selectively movable to receive the intrinsic light and fluorescent light on a plurality of light paths relative to specimen.

9. The system of Claim 6, further including an optical scanner to provide the intrinsic light and fluorescent light to the light detector on a plurality of light paths relative to specimen.

10. The system of Claim 1, wherein the apparent light source includes a light directing device to selectively move the apparent light source to direct the excitation light on a plurality of light paths toward the specimen.

11. The system of Claim 10, wherein the light directing device includes an optical switch to selectively move the apparent light source to provide the plurality of light paths toward the specimen.

12. The system of Claim 10, wherein the light directing device includes a movable mirror to selectively move the apparent light source to provide the plurality of light paths toward the specimen.

13. The system of Claim 10, wherein the light directing device is adapted to selectively move the apparent light source in translation along at least one apparent light source translation axis.

14. The system of Claim 1, wherein the specimen is selectively movable to provide the excitation light on a plurality of light paths relative to the specimen.

15. The system of Claim 14, wherein specimen is selectively movable in rotation about a specimen rotation axis.

16. The system of Claim 14, wherein specimen is selectively movable in translation along at least one specimen translation axis.

17. The system of Claim 14, wherein specimen is selectively movable in rotation about a specimen rotation axis and the specimen is further selectively moveable in translation along at least one specimen translation axis.

18. The system of Claim 1, wherein the apparent light source includes a light directing device to selectively move the apparent light source to direct the excitation light on a plurality of light paths toward the specimen and the specimen is selectively movable to provide the excitation light on a plurality of light paths relative to the specimen.

19. The system of Claim 1, wherein the intrinsic light passes through the specimen as transillumination light.

20. The system of Claim 1, wherein the intrinsic light reflects from the specimen as reflectance light.

21. A method of optical tomography, comprising:

generating excitation light with an apparent light source adapted to project the excitation light toward a specimen having fluorescent proteins therein, wherein the excitation light enters the specimen becoming intrinsic light within the specimen, wherein the intrinsic light is adapted to excite fluorescent light from the fluorescent proteins, and wherein the intrinsic light and the fluorescent light are diffuse.

22. The method of Claim 21, wherein at least one of the excitation light and the fluorescent light has a wavelength in the visible wavelength range.

23. The method of Claim 21, wherein the fluorescent light has a wavelength in the visible wavelength range.

24. The method of Claim 21, wherein the fluorescent light has a wavelength in the red portion of the visible wavelength range.

25. The system of Claim 21, wherein the fluorescent light has a wavelength in the near infrared (NIR) region.

26. The method of Claim 21, further comprising:

receiving the intrinsic light exiting the specimen;

receiving the fluorescent light exiting the specimen;

converting the received intrinsic light into first image information;

converting the received fluorescent light into second image information;

generating a model adapted to predict light propagation in a diffuse medium; and

combining the first image information, the second image information, and the model to provide an image of the fluorescent proteins.

27. The method of Claim 26, wherein the receiving the intrinsic light and the receiving the fluorescent light include receiving the intrinsic light and receiving the fluorescent light with a selectively movable light detector adapted to receive the intrinsic light and fluorescent light on a plurality of light paths relative to specimen.

28. The method of Claim 26, wherein the model is generated in accordance with a solution to a diffusion equation having a modified diffusion coefficient associated with at least one of the intrinsic light and the fluorescent light.

29. The method of Claim 21, further comprising selectively moving the apparent light source to direct the excitation light on a plurality of light paths toward the specimen.

30. The method of Claim 29, wherein the apparent light source includes an optical switch to selectively move the apparent light source.

31. The method of Claim 29, wherein the apparent light source includes a selectively movable mirror to selectively move the apparent light source.

32. The method of Claim 29, wherein the selectively moving the apparent light source includes selectively moving the apparent light source in translation along at least one apparent light source translation axis.

33. The method of Claim 21, further comprising selectively moving the specimen to provide the excitation light on a plurality of light paths relative to specimen.

34. The method of Claim 33, wherein the selectively moving the specimen includes selectively moving the specimen in rotation about a specimen rotation axis.

35. The method of Claim 33, wherein the selectively moving the specimen includes selectively moving the specimen in translation along at least one specimen translation axis.

36. The method of Claim 33, wherein the selectively moving the specimen includes:

selectively moving the specimen in rotation about a specimen rotation axis; and

selectively moving the specimen in translation along at least one specimen translation axis.

37. The method of Claim 21, further comprising:

selectively moving the apparent light source to direct the excitation light on a plurality of light paths toward the specimen; and

selectively moving the specimen to provide the excitation light on another plurality of light paths relative to the specimen.

38. The method of Claim 21, wherein the intrinsic light passes through the specimen as transillumination light.

39. The method of Claim 21, wherein the intrinsic light reflects from the specimen as reflectance light.

40. A system for optical tomography, comprising:

at least one selectively movable component to selectively move an apparent light source to direct a plurality of light paths toward a specimen.

41. The system of Claim 40, wherein the selectively movable component includes at least one selectively movable mirror.

42. The system of Claim 40, wherein the selectively movable component includes a selectively movable structure.

43. The system of Claim 42, further including an optical fiber coupled to the selectively movable structure.